Chapter 14. Developing and integrating a student-researcher pedagogy within the geography curriculum

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Introduction

The theoretical context for this chapter is founded on the idea that actively engaging in research should be an entitlement for all higher education geography students (Walkington and Jenkins, 2008). Undergraduate research is one of eleven 'high impact' practices (HIPs), educational approaches which result in positive outcomes such as student engagement and retention (Kuh, 2008). However, several other HIPs intersect with a research-based learning pedagogy. 'Capstone projects' are often research based (such as a final year dissertation), 'collaborative assignments' are frequently project based, involving teams in research, and in geography 'common intellectual experiences' are often experienced during fieldwork where research skills are practised. Perhaps less obvious are 'writing intensive courses' and 'First year seminars' which have great potential to be research-based and support the scaffolding of a 'student-researcher' pedagogy.

This chapter is grounded in the belief that rather than viewing students as consumers they can become producers or co-producers of knowledge, through engagement with disciplinary research in geography. The work is therefore situated in a partnership learning model based on disciplinary research (Healey *et al.,* 2014). It is also informed by the view that *self-authorship* or the capacity to author one's own beliefs, values, sense of self, and relationships with others (Baxter-Magolda, 2009) is a central goal of higher education in the 21st Century (Baxter-Magolda, 2004).

This chapter outlines a 'student-researcher' or research-based learning curriculum, describing the possibilities of this pedagogic approach, the different contexts in which it can be developed and the levels of student engagement that can be achieved in terms of participation and ownership of the research process. Disseminating research results is an integral part of the research process in which students should be involved, so after consideration of the range of different research dissemination formats and the levels of exposure appropriate for student research in geography, the chapter provides empirical data on the contrasting student learning gains from two case studies. The first is based on writing for a national undergraduate research journal of geography, GEO*verse*, and it presents the

experience of engaging in writing and reviewing processes for undergraduate student authors and postgraduate reviewers. The second explores the student experience of presenting and participating at a variety of student research conferences, from dedicated geography conferences to presenting geographical research at multidisciplinary events. This is the first time that the two research dissemination formats have been compared empirically and differences in student engagement and self-authorship are highlighted. The chapter discusses the relative merits and challenges raised by the case studies and provides suggestions for linking and scaffolding research experiences and dissemination opportunities in a more integrated way through a programme level approach to student research and dissemination. The chapter closes with a discussion of the academic's role in the supervision and mentoring of student research and begins to explore the characteristics of effective research mentors.

A Student-researcher pedagogy

Research-based learning is an active pedagogy emphasising the process of research and inquiry to develop student knowledge and understanding, and in some cases to contribute to the broader knowledge base of geography as a discipline. A four-fold typology to describe the way in which research can be integrated into the curriculum is based on whether students are treated as *participants in* research or an *audience for* research, and whether there is a focus on the *research content* or research as a *process*. These distinctions are somewhat artificial and in reality much research is carried out at the intersections, however, they provide a useful classification of pedagogic approaches: 'research led' (learning about current research in the discipline); 'research oriented' (developing research skills and techniques); 'research tutored' (engaging in research discussions); and 'research based' (actively undertaking research and inquiry) (Healey *et al.,* 2014).

Kuh and O'Donnell (2013) argue that the deepest engagement in student research happens when students participate in all aspects of the research process, from problem identification to public dissemination, ensuring that reflection is part of the research process. All four approaches are necessary to prepare students for research and allow them to 'complete the research cycle' (Walkington, 2008). The staff – student relationship in developing a 'student-researcher' pedagogy is significant as it shifts the traditional role of teacher as assessor to that of co-inquirer, and students have the potential to become experts in their research area.

Despite undergraduate project work having been a part of higher education learning for two centuries (Council on Undergraduate Research, 2005), the emphasis on research as a

pedagogic practice has only relatively recently become an internationally recognised endeavour, with numerous studies demonstrating benefits for student learning (see for example Alamodi *et al.,* 2014 in the Middle East; Padmaja *et al.,* 2015 in India; Sandover *et al.,* 2012 in Australia and the UK; van der Rijst and Visser-Wijnveen, 2011 in the Netherlands; and Yuhao, 2014 in China). Particular benefits include the efficacy of undergraduate research in promoting critical thinking and reflection, increasing motivation and confidence, and (for some) the intention to pursue post-graduate study (Hunter, *et al.,* 2007; Russell, *et al.,* 2007).

Healey (2017) has collated international examples of work to strengthen the research-teaching nexus across a range of disciplines. A meta-analysis of this literature reveals nine international practices that can be implemented across a broad range of contexts (Walkington, 2016). The nine practices are exemplified below with selected examples from the geographical literature.

The first six practices focus on providing opportunites for students to:

1. interview researchers e.g. inviting in guest lecturers, students interviewing academic staff about their research in class (Dwyer, 2010), contacting published authors;
2. engage in student centred active learning e.g. problem based learning (Spronken-Smith, 2005) and simulations which focus on conceptual understanding rather than memorising content;
3. engage in authentic research e.g. living labs (Evans, *et al.,* 2015), consultancy, live projects (Shah and Treby, 2011);
4. engage with authentic audiences e.g. via conferences (Hill and Walkington, 2016), journals (Walkington, 2012), or the creation of other public facing outputs;
5. engage in reflective assessments of the learning process e.g. e-portfolio's and research diaries;
6. learn research methods by engaging in guided research.

A further three practices involve academic staff scaffolding:

7. the research design e.g. supporting students with the process of framing enquiry (Walkington, *et al.,* 2011) and providing constructive feedback on research proposals;
8. the reading process e.g. running journal clubs, provide pre-reading for lectures and structure face to face class discussion sessions to check for understanding, include critical reviews of journal articles as individual assignments;

9. the writing process e.g. peer review activities (Nicholson, 2011), and linking to dedicated student journals.

The scaffolding process, which allows for experiential learning and reflection, is outlined in more detail in the section on programme-level design below.

<c> Dimensions for framing the undergraduate research context

Within geographical research there are a variety of contexts within which students can develop as researchers. First, the *people* involved provide the context of supervision, mentorship, or working within a research group involving academics, postgraduates and perhaps peers. Second, the *place* in which the student is working can differ according to the nature of the research, it may be predominantly field–based, in urban or rural environments, distant or local places, in a laboratory, working with collections, archives, and online data. Finally, the *time* frame can differ significantly e.g. involvement in ongoing long-term projects, summer schemes, within the curriculum or a taster session.

The range of contexts within which student research takes place can be described in relation to a series of bipolar dimensions (Walkington, 2015; Brew, 2013). Table 14.1 outlines 8 prompt questions to consider the dimensions of focus, originality of the research, motivation, inclusivity, setting, collaboration, audience, compensation and staff – student relationship.

Table 14.1: Prompt questions to establish the context for a 'student-researcher' framework in an assessment, module, programme or department.

1. Focus	What is the focus of the research, is it pedagogic (student learning), the creation of new knowledge for students, or original research findings?
2. Setting	In what setting does the research take place, is it embedded or extra/co-curricular?
3. Inclusivity	How inclusive is the research opportunity, can all students take part or is it selective (e.g. part of a paid-for expedition, only open to students who achieve a particular grade, only offered at honours level)?
4. Relationship	What is the nature of the staff-student relationship, is it a partnership?
5. Collaboration	Is there a collaborative element to the research, does it take place in a group /team?
6. Motivation	Where does the motivation for the research come from, is it student or staff initiated?

7. Audience	Who is the anticipated audience for the research? a campus, community, public or professional audience?
8. Compensation	If this is an extra-curricular project, are students compensated for their time either through modular credit or in the form of payment?

The prompts in Table 14.1 are useful for thinking through the design of a new research-based learning project. Three examples below show how the research context can differ significantly in terms of duration of the research experience, involvement in research teams, the autonomy of student research design and relationship to the formal curriculum.

1. An undergraduate module comprised a weekly lecture followed by a laboratory class. To learn laboratory techniques, the whole class was provided with samples from the module leader's field site. Each group was allocated a proportion of the samples. In the laboratory a new technique was taught each week and the students had to complete the laboratory test on the samples, sharing their results across the whole class in an online format provided by the teacher. The final module assessment was an individual write-up of the results and discussion section of a journal article (for which the introduction and methods were provided by the teacher). The students had to synthesise and make sense of all the shared data to complete their assignment.

2. An institutionally funded summer research opportunity. The scheme was highly selective and occurred outside the curriculum, over the long vacation. The research was carried out within an existing research group and new knowledge was the long-term target. The research group was formed through an academic collaboration between several disciplines and the research disseminated through a conference on campus, with the potential for publication in the future. The student received a stipend to take part and the staff member acted as a mentor in the research process.

3. An undergraduate final year fieldtrip to Mexico which formed part of a module. A group of eight undergraduate students were accompanied by a Professor, a post-doctoral student and a Masters' student. The mix of staff and students, in a fieldwork setting, allowed the undergraduates to gain useful insights into how to undertake fieldwork as well as follow up supervision on data analysis and report writing. Each student devised their own project and collected and analysed their own data. The module assessment was a journal article.

The three examples reveal that the design of the curriculum can result in different levels of participation and student engagement in the research process.

Levels of student engagement in research

Students can participate in research to different degrees determined by: ownership of the research question; the level of guidance that students receive; the degree of autonomy that students hold to modify the research as it progresses; and choices made about the dissemination of outcomes. The Research Skill Development Framework of Willison and O'Regan (2007) provides a useful frame of reference (for any discipline and from primary schooling to doctoral level) for showing progressive levels of attainment and autonomy against six facets of the research process from clarifying a question, through to dissemination of results.

Walkington (2015) conceptualised five successive levels which students may participate at over the course of an undergraduate degree programme. Being assigned a research task with a prescribed methodology has been conceptualised as ***Level 1***, see example 1 above. At ***level 2*** students are consulted about research design or analytical technique. An example might be a summer research opportunity where a staff member is working on an ongoing project and students engage in tutor directed research with the ability to influence the project and contribute to its dissemination, such as in example 2 above. At ***level 3***, while staff frame the enquiry initially, students have a much greater role to play in decision-making with respect to development of methods, reframing, determining courses of action and taking responsibility for the outcomes and dissemination. At ***Level 4*** students make the decisions but do not consult with university staff. Some students adopt this approach to their dissertation or final project and choose to work unsupervised. This lone worker model may have produced more effective results if the student had received feedback during the process. Initiating a self-directed project with a staff member acting as a mentor is conceptualised as ***Level 5***. Here students frame their own enquiry and carry out the research, but in consultation with university staff at a level determined by the student. This allows the student to gain ongoing feedback when they want it and allows them to develop a relationship with an academic research mentor. The undergraduate students in example 3 above could potentially engage at Level 5 (see Walkington 2016c in the Useful Resources section later in this chapter).

Programme level curriculum design

A geography programme should allow students to move from being an *audience* for geographical research to becoming an active *participant* in its creation, a researcher. Over time there will be iterative shifts in emphasis between research *content* and the research *process*. The blend and sequencing of these roles and activities should guide the programme team in designing a well scaffolded and progressive curriculum which supports the transition from guided small-scale team-based research, to autonomous research projects (Spronken-Smith and Walker, 2010) which can then strengthen the links between teaching and research. Walkington et al (2011) asked 52 international geography academics to identify research skills that are particularly challenging to teach. 'Framing good research questions', and 'developing critical thinking' were deemed most challenging. The authors provided examples of how to scaffold the development of research skills across a geography programme. Initially, students might participate in discrete tasks in the curriculum e.g. small-scale data collection or manipulating research data with assignments to simulate research processes. When students are engaged in data analysis, it is important to ensure that they support all their ideas with evidence, so requiring students to make critical judgments (Hinchliffe and Walkington, 2016) about information, arguments, and methods to evaluate the validity and reliability of data is important. As students progress to synthesising and organising material into new, more complex interpretations and relationships, they should learn appropriate presentation styles. Disseminating results is important for promoting reflection and enables students to see the transferable (employability) skills associated with being a researcher as well as developing a sense of belonging to the geographical research community.

An effective way to learn geographical content and methods is *through* engagement in research, progressively building confidence and autonomy. Ideally, research should be encountered early in the student learning experience (Walkington, *et al.,* 2011) so students' understanding is scaffolded. The geography curriculum is challenging to teach because it requires a familiarity with qualitative *and* quantitative research methodologies, reinforcing the need to start earlier. The many specialist subdisciplines have particular methods and techniques in which a student may require training. Careful planning is also required to support students so that *"regardless of the nature of the research, the student's learning requires critical reflection on the potential risks as well as the moral and ethical issues of the research project"* (QAA, 2014, p. 13).

Disseminating student research findings

The Boyer Commission (1998, p. 24) made it clear that sharing the results of research is part of the research process, and students should experience this process in its entirety. This has led to significant interest in dedicated student conferences and undergraduate research journals (Walkington, 2015) as authentic modes of dissemination. However, many other public formats exist including blogs, video-diaries, podcasts, online/virtual conferences, group wiki's, published books, trail guides and papers, consultancy reports to clients, exhibitions and shows, etc. Altering the assessment brief for courses/ modules can open students up to the possibility of publishing their work. Replacing dissertations with alternative assessments (Hill, *et al.,* 2011) can involve writing for authentic audiences (e.g. journal articles, briefing papers, web pages) and the development of employer-related transferable skills.

Levels of exposure and strategies for engaging students in research dissemination

There are a range of levels at which student research can be shared beyond the curriculum (Spronken-Smith, *et al.,* 2013) from events for just geographers within the university, to sharing geographical research nationally, or in multidisciplinary settings.

A variety of strategies have been reported to embed publication in the student learning experience (Walkington, 2014; Walkington *et al.,* 2013). To engage students with research dissemination it is possible to *build publication into degree programme requirements*. Writing a journal article for a real audience based on final year research is a more transferable skill than writing a 10,000 word thesis for two markers. Explicitly *identifying activities as research* such as literature reviewing, peer review, data synthesis and data presentation makes research accessible to all students. *Using student research findings in the curriculum* also demonstrates the value that staff members put on a 'students as researchers' approach. *Engaging students in the publication process* (e.g. as editors/reviewers, sourcing articles, conference / event organisation, marketing and promotion) allows all students to take on a role, even if those students' own research was not suitable for publication. Confidence is one of the biggest barriers to authentic research dissemination, so *scaffolding publication opportunities* is important e.g. sharing results in class, then presenting at mini-conferences within a course or module which can in turn build confidence to participate in departmental or institution-wide events. A journal article format for an assignment might develop into a submission for an institutional journal, or co-authorship with a faculty member. Presenting project findings to academic staff in preparation for real client presentations might provide a stepping stone to a national conference. Blogging, before producing final written outputs for

a publicly accessible repository, allows for dialogue and feedback with an authentic online community.

Case studies

The UK's Quality Assurance Agency (QAA) subject benchmark statement for geography, outlines the expectations of a degree in terms of likely content, skills and experiences. It provides descriptors for threshold, standard and excellent levels of achievement. In terms of research, excellence can be demonstrated by the quality of a student's ability to communicate complex arguments to a variety of audiences (*ibid*, p. 18). Yet, there is little empirical work on the student learning gained from participation in research dissemination activities. With only two journals in the world dedicated to sharing research in geography at undergraduate level, GEOview in Australia and GEOverse in the UK, the first case study begins to address this gap by detailing the learning gained from participation in GEOverse, a national e-journal involving undergraduate student authors and postgraduate reviewers. The second case study explores the participation of undergraduate geographers in student research conferences, ranging from discipline specific to multidisciplinary, and at different levels from departmental to national. This is the first time the two dissemination formats have been compared empirically and strategies for maximising the benefits of each format are provided.

Undergraduate research journals

GEOverse, a national level journal dedicated to sharing undergraduate research in geography, was launched at the same time as an institutional journal called Geoversity at Oxford Brookes University, UK. The journals adopt a peer review process with postgraduate students carrying out collaborative reviews, in order to ensure that a consistent set of constructive feedback comments are received by the undergraduate author. Postgraduate students therefore carry out the reviews separately, then come together online through a wiki to align their feedback (Walkington, 2012). This rigorous environment of review allows undergraduate research to reach the public domain. Decisions about the journal process, format, focus and values for GEOverse are outlined in Walkington (2008).

Data was collected via questionnaires to three groups: students for whom writing a journal article was a new curriculum-based assignment (27 responded from 87 students), successfully published authors in GEOverse and Geoversity (all published authors

responded), and postgraduate reviewers from across multiple institutions in the UK (7 of the 16, i.e. all of those who had carried out reviews at that time).

For the first two groups the questionnaire focused on the experience of writing a journal article including the benefits and challenges, skills developed, the impact of the review process and the impact of writing for publication on the research process itself (Walkington, 2012), themes from the applied thematic analysis (are indicated in italics. Because it was a new format, students reported finding it 'hard to change between writing as a learner to writing as a teacher.' The students who wrote an article but did not go on to submit it for publication identified three differences to other university assessments: a sense of *ownership* over their research that they had not experienced in previous assignments; a greater *sense of understanding* of the research because of having to justify all aspects in the journal format; and a sense of *creativity* in the writing process, including the ability to leave out material and develop a personal argument. The same group of students shared three further themes with students who submitted their work for publication and successfully became authors: the sense of *achievement* they felt after completing their article; the ability to *apply constructive criticism* (because the journal article process was replicated by the assessment task where students submitted a draft for constructive comments); and gaining the skills of *critical evaluation* of their own work as a result. Themes reported exclusively by the published authors were: *CV material* in terms of a publication; the feeling of *academic recognition* through being published; and a *desire to publish further work* in the future. Finally, they reported a *desire for further dialogue* about their research, partly in frustration at the anonymous review process which only allowed written feedback, whereas students wanted a conversation, and to clarify reviewer comments *(ibid)*.

For the postgraduate reviewers, the main benefit was being part of a wider geographical community beyond the institution they were based in, as well as developing their reviewing skills as an indirect enhancement to their own writing practice. Interestingly they also struggled giving anonymous written feedback and would have liked a conversation with the authors about the review. The online journals created opportunities for detailed feed-forward and supported iterative processes through writing, reviewing and rewriting. Trusting the written advice of anonymous reviewers was a significant step for authors. Students also reported that their engagement with the literature changed as a result of the journal projects. They stopped reading web and textbook material in favour of journal articles, to immerse themselves in the journal format. As their understanding of the peer review process grew, they understood the importance of clearly justifying their findings in the light of other alternative but peer-reviewed interpretations.

Student Research Conferences

Alongside the international spread of undergraduate research as a pedagogy there has been a growth of multi-disciplinary undergraduate research conferences, culminating in the first World Congress on Undergraduate Research in 2017. This is founded on a strong legacy of annual national conferences in the US with the long running National Conference on Undergraduate Research (NCUR), which inspired the British CUR since 2011 and Australian CUR in 2012. There are also events in Canada, Ireland and the Netherlands as well as a newly established World Conference. However, evidence for the benefits of student participation in these multidisciplinary conferences is limited (Mabrouk, 2009). This case study shows that student research conferences provide an opportunity for students to develop professional capabilities for employment because they promote reflection on learning, the ability to communicate high-level concepts in lay terms to a broad audience, and the ability to make sound judgements 'in the moment'.

Hinchliffe and Walkington (2016) found that geography students presenting in a faculty-wide conference saw it as a space to contest knowledge and made three types of judgement: judgement of the material to include for an audience beyond (but including) their own discipline; judgement of the effectiveness of themselves as a presenter; and judgement of the value of their research. The most capable students could judge the suitability of their knowledge in the conference setting and reframe it to ask questions to students from other disciplines. They could also engage in dialogue about their own research to establish intrapersonally grounded values, a key aspect of self-authorship (Baxter-Magolda, 2009). As one physical geography student noted:

> *A conference has two outcomes, I mean it could be seen as informing the people that come to the conference, but it also informs the person presenting at the conference, it is sort of a dual feedback system in other words, it is not just the person coming to the conference who gets information, because by asking questions they're testing the knowledge of the person doing the presentation. That enables me to look more critically at the work I've produced… [an anthropologist] had a different perspective, which allowed me to develop my thoughts about the issue. (ibid).*

Walkington *et al.,* (2016) undertook 90 interviews with students from the full range of undergraduate disciplines who presented a poster or paper at the British Conference of Undergraduate research (BCUR) in three consecutive years (14% of total participants) 2012-

2014. They revealed that students ask each other challenging questions, in a liminal environment free from assessment constraints. The language that students need to adopt in this multidisciplinary setting is free from disciplinary jargon. At the highest level, students were empowered to develop their own pedagogy of reciprocal elucidation (a form of bi-directional knowledge exchange). The same data set was also mapped onto the Vitae Researcher Development Framework (Kneale, *et al.,* 2016), revealing how the students develop the skills that employers' value in their preparation for and participation in the conference. Hill and Walkington (2016) used graduate attributes and self-authorship as concepts to study the learning experiences specific to the Geography, Earth and Environmental Science participants at BCUR. The students identified themselves as researchers as they gained in confidence and moved towards self-authorship through dialogue, by balancing their disciplinary knowledge with goals and values grounded in intra-personal interactions. All students across the data set felt empowered by engaging successfully in an authentic experience which allowed them to escape institutional and disciplinary 'bubbles.' One particularly positive aspect of this for the geography students taking part, was the ability to step back and see how other disciplines approach familiar research topics. In so doing, students gained a sense of their GEES perspective and reflected on how their university experience has given them a lens through which to view the world, but also the ability to connect to students from other disciplines. Geography students were generally well prepared for this type of activity because of the synthetic nature of the discipline in which they have to engage with different perspectives, world views, methodologies and ontologies.

Comparing learning gains

The two empirical case studies presented have shown that engaging in research dissemination provides different experiences for students depending on the context and format of the dissemination activity. Journals provided students with a requirement to trust and address the written advice of anonymous others, the ability to work with detailed feed-forward (rather than feedback) on their article and they were required to develop critical skills through reflection on their writing. The successful student authors gained recognition as researchers, however the experience was not dialogic and the lack of a conversation about the research between authors and reviewers was particularly challenging.

In contrast, when presenting at a conference, students had to engage with critical thinking through dialogue. Rather than written comments, they gained instant dialogic feedback from a range of perspectives. They too gained critical skills through reflecting on their conference

experience, and were also recognised by others as researchers, which impacted on their identity. However, the timing of most conferences late in the academic year, meant that as a final experience, it was often impossible to take on board the feedback they'd received at the event and turn this into credit within their programme, such as through changes to a capstone project or dissertation. Unlike a journal article, the lack of a discoverable artefact to represent their research, meant students found the lack of a 'legacy' disadvantageous in comparison to the journal article format.

In terms of self-authorship both formats engaged students in authoring and justifying their own beliefs, but in different ways. Conferences, due to their multidisciplinary nature, allowed for the 'reciprocal elucidation' of ideas (Walkington *et al.*, 2016) at the event. The unanticipated audience and dialogic format in the conference provided a more liminal fluid, 'borderland' environment (Hill *et al.*, 2019), so identity changes (being an expert/ professional) were more frequently reported, and ideas were more open to negotiation than through the journals. The shift in power between staff and students was also more frequently noted in the poster style conference setting as students gained their 'voice' rapidly, and repeatedly experienced recognition as an authority on their topic. In contrast, the reviewers for the journal, being anonymous and offering more critique than praise, retained a more static and non-negotiable power over ideas. Students were more active in their conference experience and a broader range of students, as well as members of the public, could participate. The journal allowed for written engagement between authors and reviewers, but a more passive engagement for readers.

In terms of the learning gained from participating in the publication process through either the journal or conference, students learnt about how to enhance the presentation of their research in an iterative way. By understanding the differences in student learning gains from journal authorship to conference presenter, it is possible to minimise negative aspects. Changing the timing of conferences so that they come early enough for feedback from the event to be incorporated into the work that students go on to submit for credit, or publication as an article, utilises the conference as a formative event part way through the research writing phase. Creating digital artefacts (such as posters online or short presentations to camera saved as video files) for people to access who were not able to attend the event face to face can provide a legacy from conferences, without investment in a journal. Such digital artefacts can be linked to online CV's and portfolios. The *Get Published!* student research collection at Oxford Brookes University is part of a dedicated student research repository which includes making posters from the annual institution-wide student conference publicly available.

From an academic's perspective establishing and running a journal is a much more resource intensive activity than the organisation of a poster conference, and institutional conferences yield similar benefits to national events where they are interdisciplinary (Pavlakou and Walkington, 2018). The publication of digital artefacts of a range of types, such as student posters, animated presentations with voice overs, vodcasts of students talking to camera about their research, blog posts and so on, all allow students to share their research at minimal cost, with a wide audience, and to gain the benefits of completing the research cycle. To this end institutional research repositories may provide the infrastructure to display student research across a variety of disciplines, both within and beyond the institution.

Mentoring student research

As research into the benefits of undergraduate research participation across a variety of disciplines has become more extensive (Lopatto, 2009), it is apparent that the quality of academic mentoring is a crucial driver to successful outcomes (Shanahan *et al.,* 2015). Whilst research supervision focusses primarily on the research project and outcomes, research mentoring focusses on the whole student and how the research fits into their learning, sometimes with a longer-term view of developing skills for future careers, and in a way that benefits both the student mentee and the mentor (Koch and Johnson, 2000). A literature review of 20 years of articles on the behaviours adopted when mentoring student researchers reveals ten salient practices characteristic of effective academic research mentors (Shanahan, *et al.,* 2015; Walkington, *et al.*, 2018) see table 14.2 below. The balance between a research focus and student development focus is clear from the practices.

Table 14.2: Practices of effective undergraduate research mentors (adapted from Walkington, et al., 2018).

Effective Practices of Undergraduate Research Mentors	
1.	Plan in order to respond to students' varying needs and abilities throughout the research process.
2.	Set clear scaffolded expectations for undergraduate researchers.
3.	Teach the methods and techniques of conducting research in the discipline.
4.	Balance rigorous expectations with emotional support and appropriate personal interest in students.

5.	Develop a community among groups of undergraduate researchers and mentors, including graduate students, and other members of the research team.
6.	Dedicate time to one-to-one, hands-on mentoring.
7.	Increase student ownership of the research over time.
8.	Support students' professional development through networking and explaining the norms of the discipline.
9.	Create opportunities for peers and 'near peers' to learn mentoring skills and to engage more students in research.
10.	Encourage students to share their findings and provide guidance on presenting work in a variety of formats.

The socio-cultural and emotional benefits that arise from mentored research, which take place face to face in one-to-one relationships, benefit students from non-traditional backgrounds in particular (Shanahan, *et al.,* 2017) with practices such as taking students to discipline conferences and helping them network (see practices 4, 8 and 10 in Table 14.2). Continuing to support students through to the research dissemination phase of the research cycle is therefore central to the widening participation agenda.

Mentoring students is a resource intensive activity that can provide challenges for academics (Walkington, *et al.,* 2018). In order to maximise participation, mentoring can take place through a variety of models from traditional one-to-one faculty mentor- student mentee relationships, to involving graduate students mentoring teams, and utilising peer mentors in either vertical or horizontal groupings. Academics may also co-mentor students (Ketcham, *et al.*, 2018), particularly for mixed methods projects or interdisciplinary research.

Conclusion

Engaging in research is an essential part of asserting the value of geographical thinking and ensuring that graduates develop geocapabilities, in addition to generic graduate attributes (Walkington, *et al.,* 2017). While it is clear that institutional research cultures and strategies *can* be inclusive of students as researchers, and that we *can* personalise and professionalise the curriculum through providing research and dissemination opportunities for students, this requires academics to progressively structure authentic research experiences for students to help build confidence, reflective capabilities and provide liminal

environments for the development of self-authorship. This chapter suggests that we should strive to do this early, in dialogic settings, and through carefully scaffolded experiences within and beyond the curriculum. Moreover, to open research experiences to all our students we should adopt embedded research experiences in small teams, with a transition to carefully planned research mentoring, as students take on the identity of producers of knowledge in their own right.

Useful resources

- Walkington, H. (2016a) Disseminating student research York: HEA Accessed from: https://www.heacademy.ac.uk/system/files/resources/walkington-disseminating-student-research.pdf
- Walkington, H. (2016b) Engaging students in research. York: HEA Accessed from: https://www.heacademy.ac.uk/system/files/resources/walkington-engaging-students-in-research.pdf
- Walkington, H. (2016c) Levels of student participation in research. York: HEA Accessed from: https://www.heacademy.ac.uk/system/files/resources/walkington-levels-of-student-participation-in-research.pdf
- Walkington, H. (2016d) Pedagogic approaches to developing students as researchers within and beyond the curriculum. York: HEA Accessed from: https://www.heacademy.ac.uk/system/files/resources/walkington-pedagogic-approaches.pdf
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